REMARKS

The Office Action dated June 15, 2007 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1-17 and 20-29 are currently pending in the application. Claims 1, 5, 8, 11, 15, 20, 22, 24, and 26-29 have been amended to more particularly point out and distinctly claim the subject matter of the invention. No new matter has been added and no new issues are raised which require further consideration or search. Claims 1-17 and 20-29 are respectfully submitted for consideration.

The Office Action rejected all of claims 1-17 and 20-29 under 35 U.S.C. §103(a) as being unpatentable over Liu (U.S. Patent No. 6,980,537) in view of Lu (U.S. Patent No. 5,761,195), and further in view of Maxemchuk (U.S. Patent No. 6,219,346). The Office Action took the position that Liu discloses all of the elements of the claims, with the exception of a wireless integrated network with a sink node on each tier and also "did not disclose expressly the particular application involving wireless integrated with wired network for the wireless access" (Office Action, page 6). The Office Action then relied upon Lu and Maxemchuk as curing these deficiencies in Liu. This rejection is respectfully traversed for at least the following reasons.

Claim 1, upon which claims 2, 3, 4, and 21 are dependent, recites a wireless access network. The wireless access network includes a first-tier mesh formed of a plurality of first-tier nodes, each of the first-tier nodes of the plurality of first-tier nodes capable of

communicating data within the first tier with at least selected others of the first-tier nodes, at least one of the first-tier nodes forming a first-tier sink node. The wireless access network also includes at least a second-tier mesh formed of a plurality of second-tier nodes, each of the second-tier nodes of the plurality of second-tier nodes capable of communicating data within the second tier with at least selected others of the second-tier nodes, at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating with the first-tier sink node of the first-tier mesh. The wireless access network provides radio communication of data therein

Claim 5, upon which claims 6-7 are dependent, recites a wireless access network. The wireless access network includes a first-tier mesh formed of a plurality of first-tier nodes, each of the first-tier nodes of the plurality of first-tier nodes capable of communicating data within the first tier with at least selected others of the first-tier nodes, at least one of the first-tier nodes forming a first-tier sink node. The wireless access network also includes at least a second-tier mesh formed of a plurality of second-tier nodes, each of the second-tier nodes of the plurality of second-tier nodes capable of communicating data within the second tier with at least selected others of the second-tier nodes, at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating with the first-tier sink node of the first-tier mesh. The first-tier mesh comprises an ad-hoc mesh which exhibits an ad-hoc configuration and an ad-hoc number of first-tier nodes. The wireless access network provides radio communication of data therein

Claim 8, upon which claims 9-10 are dependent, recites a wireless access network. The wireless access network includes a first-tier mesh formed of a plurality of first-tier nodes, each of the first-tier nodes of the plurality of first-tier nodes capable of communicating data within the first tier with at least selected others of the first-tier nodes, at least one of the first-tier nodes forming a first-tier sink node. The wireless access network also includes at least a second-tier mesh formed of a plurality of second-tier nodes, each of the second-tier nodes of the plurality of second-tier nodes capable of communicating data within the second tier with at least selected others of the second-tier nodes, at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating with the first-tier sink node of the first-tier mesh. The second-tier mesh comprises a pre-configured mesh which exhibits a fixed configuration and a fixed number of second-tier nodes. The wireless access network provides radio communication of data therein

Claim 15, upon which claims 16-17 are dependent, recites a wireless access network. The wireless access network includes a first-tier mesh formed of a plurality of first-tier nodes, each of the first-tier nodes of the plurality of first-tier nodes capable of communicating data within the first tier with at least selected others of the first-tier nodes, at least one of the first-tier nodes forming a first-tier sink node. The wireless access network also includes at least a second-tier mesh formed of a plurality of second-tier nodes, each of the second-tier nodes of the plurality of second-tier nodes capable of communicating data within the second tier with at least selected others of the second-tier

nodes, at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating with the first-tier sink node of the first-tier mesh. The at least one of the first-tier nodes forming the first-tier sink node comprises a first first-tier node forming a first first-tier sink node and at least a second first-tier node forming a second first-tier sink node, wherein the at least one of the second-tier nodes forming the second-tier sink node comprises a first second-tier node forming a first second-tier sink node and at least a second, second-tier node forming a second second-tier sink node, the first first-tier sink node capable of communicating with the first second-tier sink node, the second first-tier sink node capable of communicating with the second second-tier sink node, and the first and second second-tier sink nodes, respectively, capable of communicating therebetween. The wireless access network provides radio communication of data therein

Claim 20 recites a method including forming a wireless access network providing for communication therein. The method further includes forming a first-tier mesh of a plurality of first-tier nodes, each of the first-tier nodes capable of communicating data within the first tier with at least selected others of the first-tier nodes, at least one of the first-tier nodes forming a first-tier sink node. The method also includes forming a second-tier mesh of a plurality of second-tier nodes, each of the second-tier nodes of the plurality of second-tier nodes capable of communicating data within the second tier with at least selected others of the second-tier nodes, at least one of the second tier nodes

forming a second-tier sink node further capable of communicating with the first-tier sink node of the first-tier mesh formed during the operation of forming the second-tier mesh.

Claim 22, upon which claim 23 is dependent, recites a first-tier sink node comprising at least one first-tier nodes, wherein the at least one first-tier nodes form a first-tier mesh, and the first-tier sink node communicates data within the first tier with at least selected others of the at least one first-tier nodes and communicates data with a second-tier sink node of a second-tier network.

Claim 24, upon which claim 25 is dependent, recites a second-tier sink node comprising at least one second-tier nodes, wherein the at least one second-tier nodes form a second-tier mesh, and the second-tier sink node communicates data within the second tier with at least selected others of the at least one second-tier nodes and communicates data with a first-tier sink node of a first-tier mesh.

Claim 26 recites a first-tier sink node, comprising at least one first-tier nodes, wherein the at least one first-tier nodes form a first-tier mesh; means for communicating data within the first tier with at least selected others of the at least one first-tier nodes; and means for communicating data with a second-tier sink node of a second-tier network.

Claim 27 recites a second-tier sink node, comprising at least one second-tier nodes, wherein the at least one second-tier nodes form a second-tier mesh; means for communicating data within the second tier with at least selected others of the at least one second-tier nodes; and means for communicating data with a first-tier sink node of a first-tier mesh.

Claim 28 recites a method including forming a first-tier mesh using at least one first-tier nodes, communicating data within the first tier with at least selected others of the at least one first-tier nodes, and communicating data with a second-tier sink node of a second-tier network.

Claim 29 recites a method including forming a second-tier mesh using at least one second-tier nodes, communicating data within the second tier with at least selected others of the at least one second-tier nodes, and communicating data with a first-tier sink node of a first-tier mesh.

As will be discussed below, the combination of Liu, Lu and Maxemchuck fails to disclose or suggest all of the elements of the claims, and therefore fails to provide the features discussed above.

Liu discloses a system and method for cluster formation within a communications network by utilizing network topology information to designate network nodes that are crucial for relaying traffic as cluster head nodes, while the remaining network nodes are designated as member nodes. Liu adjusts a node status packet transmission rate or interval between successive node status packet transmissions to facilitate cluster formation independent of network size and varying initial start times of network nodes. This cluster formation is utilized to form a three tier architecture for transmission or flooding of routing information from head node databases throughout the network.

Lu discloses a method of cross-connecting an end-to-end connection between an origination mobile station and a destination mobile station in a system having a plurality

of cross-connect nodes for facilitating cellular communication among a plurality of mobile stations. Call control information is received from the origination mobile station and from the destination mobile station, and, responsive to the call control information received from the origination mobile station and the call control information received from the destination mobile station, an optimum end-to-end connection for cross-connecting the end-to-end connection is computed. The optimum end-to-end connection has a first optimum cross connect point and represents a computed shortest communication route between the origination mobile station and the destination mobile station that satisfies resource requirements for cross-connecting the end-to-end connection. The end-to-end connection is then cross-connected through the first optimum cross-connect point.

Maxemchuk discloses a packet switching architecture in cellular radio. A base station routes received packets to switching agents identified by the packets, and the switching agents forward the information contained in the packets to a wired network. As a result, the switching agent forms the interface between the packet switched portion of the cellular system and the wired network, which may be a circuit switched network. The routing of packets to switching agents allows the system to dedicate one agent to each mobile unit known to the system.

Applicants respectfully submit that Liu, Lu and Maxemchuk, whether considered alone or in combination, fail to disclose or suggest all of the elements of the present claims. For example, the combination of Liu, Lu and Maxemchuk does not disclose or

suggest "at least one of the first-tier nodes forming a first-tier sink node," or "at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating data with the first-tier sink node of said first-tier mesh," as recited in claims 1, 5, 8, 11, 15, and 20. We further argued that the cited references do not disclose or suggest "a first-tier sink node comprising at least one first-tier nodes," as recited in claim 22 or "a second-tier sink node comprising at least one second-tier nodes," as recited in claim 24, and the similar limitations recited in claims 26-29.

In the response to arguments section, the present Office Action appears to have taken the position that the services switching center (MSC) 320 and the base transceiver station (BTS) 330 of Lu correspond to the sink nodes of the claimed invention (see Office Action, page 3, lines 9-15). Applicants respectfully disagree with the Office Action's rationale and, therefore, submit that the present claims recite subject matter which is neither disclosed nor suggested by the prior art.

According to embodiments of the present invention, a multi-tiered mesh network is provided. Specifically, the network may include an ad-hoc mesh tier (AMT) 12, a pre-configured mesh tier (PMT) 14, and a PTP tier 16. A mesh network is built around sink nodes by adding mesh nodes. For instance, the AMT 12 includes sink nodes 12-S and mesh nodes 12-M. The PMT 14 includes sink nodes 14-S and mesh nodes 14-M. The PTP tier 16 includes sink nodes 16-S and mesh nodes 16-M. Sink nodes located in the area covered by one sink become connected on the mesh tier when a path of mesh nodes

is available between them. In this mesh network, the traffic flows from one node to another seeking the optimal route to the receiver even though the major part of the traffic tends to come or go to the Internet outside the radio network. Therefore, the traffic flow in a mesh network will be mainly from and towards sinks (Specification, page 10, lines 3-16 and Fig. 1).

Lu, contrary to what is asserted in the Office Action, does not disclose any elements which correspond to the sink nodes of the claimed invention. As discussed above, the Office Action seems to assert that the services switching center (MSC) 320 and the base transceiver station (BTS) 330 of Lu correspond to the sink nodes of the claimed invention. Lu only discloses a hierarchy of connections between a mobile services switching center (MSC) 320, base station controllers (BSC) 326 and 328, a base transceiver station (BTS) 330, and mobile units 300 and 302. The Office Action appears to have taken the position that the mobile units 300 and 302 correspond to the first tier nodes of the claimed invention, that the BTS 330 corresponds to the first tier sink node of the claimed invention, that the BSCs 326 and 328 correspond to the second tier nodes of the claimed invention, and that the MSC 320 corresponds to the second tier sink node of the claimed invention. However, Lu only discloses that the MSC 320 controls the BSCs 326 and 328. The BSC 326 in turn controls three BTSs 330, 332, and 334. BTS 330 controls MS units 300 and 302 while BTS unit 334 controls MS unit 304 (Lu, Column 6, lines 21-25). However, Lu does not disclose or suggest a first tier and a second tier sink node. In fact, Lu does not even disclose a first or second tier.

As outlined above, the present invention provides a multi-tiered mesh network. A mesh network is built around sink nodes by adding mesh nodes. Each of the tiers may include one or more sink nodes. Sink nodes located in the area covered by one sink become connected on the mesh tier when a path of mesh nodes is available between them. In this mesh network, the traffic flows from one node to another seeking the optimal route to the receiver even though the major part of the traffic tends to come or go to the Internet outside the radio network. Therefore, the traffic flow in a mesh network will be mainly from and towards sinks (Specification, Figure 1 and page 10, lines 3-16).

Liu, like Lu, does not disclose any elements that correspond to the sink nodes of the present invention. With respect to the head nodes, Liu teaches that certain first tier nodes are designated as head nodes. These head nodes are the nodes that form a second tier. One of these second tier head nodes are then selected as a super node. More specifically, as illustrated in Figure 8 of Liu, "nodes 10(1)-10(11) of network 200 are initially within a first tier 150. Cluster formation is performed by the first tier nodes where nodes 10(3), 10(6) and 10(9) are designated as head nodes 14(3), 14(6) and 14(9). These head nodes form a second tier 160 where each node within that tier is a head node. The head nodes of tier 160 perform cluster formation as described above and node 14(6) is designated as a super node 15(6)" (Liu, Column 14, lines 37-45).

Therefore, according to Liu, a first tier node becomes a head node which forms a second tier via the clustering process. Consequently, Liu cannot disclose or suggest that the second-tier sink node is capable of communicating data with the first-tier sink node of

said first-tier mesh, as recited in the present claims, since Liu discloses that first tier nodes are transferred to the second tier. As such, Liu fails to disclose or suggest "at least one of the first-tier nodes forming a first-tier sink node," or "at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating data with the first-tier sink node of said first-tier mesh," as recited in claims 1, 5, 8, 11, 15, and 20, and the similar limitations recited in claims 22, 24, and 26-29.

Furthermore, Maxemchuk fails to cure the deficiencies in Liu and Lu. According to embodiments of the present invention, the second tier mesh is a working communication network, having "customer nodes" communicating and being able to communicate end-to-end with each other without help of other tiers of the mesh (Specification, Figure 1). In Maxemchuk, however, the "second tier" network is merely a router network transferring packet traffic; the routers (RT) of Maxemchuk cannot establish ad-hoc links. According to Maxemchuk, the network 80 routes packets to the switch with which the mobile unit's switching agent associates (Maxemchuk, Column 4, line 67 – Column 5 line 1). Therefore, Maxemchuk, like Liu and Lu, fails to disclose or suggest "at least one of the first-tier nodes forming a first-tier sink node," or "at least one of the second-tier nodes forming a second-tier sink node, the second-tier sink node further capable of communicating data with the first-tier sink node of said first-tier mesh," as recited in claims 1, 5, 8, 11, 15, and 20, and the similar limitations recited in claims 22, 24, and 26-29.

Furthermore, Applicants respectfully submit that a person of skill in the art, at the time the invention was made, would not have been motivated to combine Liu, Lu and Maxemchuk. The stated objective of Liu is to facilitate cluster formation in accordance with network topology information to minimize the quantity of hops for data transmission within the network. Lu, on the other hand is concerned with intelligently cross-connecting bearer data paths between two cellular handsets at lower levels of a cellular network hierarchy. Accordingly, a person of skill in the art would have not been motivated to combine Liu and Lu, since Liu is concerned with cluster formation while Lu is merely directed to connecting paths between handsets at a lower level network hierarchy. As such, a person of skill in the art would not have been motivated to combine the paths connecting the handsets in Lu with the three tier hierarchical network of Liu.

Thus, for at least the reasons discussed above, Applicants respectfully assert that the combination of Liu, Lu and Maxemchuk fails to disclose or suggest that at least one of the first-tier nodes forms a first-tier sink node, and that at least one of the second-tier nodes forms a second-tier sink node, the second-tier sink node being capable of communicating data with the first-tier sink node of said first-tier mesh. Accordingly, the combination of Liu, Lu and Maxemchuk fails to disclose or suggest all of the elements of claims 1, 5, 8, 11, 15, 20, 22, 24, and 26-29.

Claims 2-4, 6-7, 9-10, 12-14, 16-17, 21, 23, and 25 are dependent upon claims 1, 5, 8, 11, 15, 22, and 24, respectively. Therefore, we may argue that claims 2-4, 6-7, 9-10,

12-14, 16-17, 21, 23, and 25 should be allowed for at least their dependence upon claims 1, 5, 8, 11, 15, 22, and 24, and for the specific limitations recited therein.

For at least the reasons outlined above, Applicants respectfully submit that the combination of Liu, Lu and Maxemchuck fails to disclose or suggest all of the elements of the claimed invention. These distinctions are more than sufficient to render the claimed invention unanticipated and unobvious. It is therefore respectfully requested that all of claims 1-17 and 20-29 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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Enclosures: Request for Continued Examination